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Managing Water Supply



Cover: Pipe delivers water from the Porcupine Reservoir to the Little Bear River near Paradise, Utah. (Photo by Ron Nichols.)

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Richard E. Lyng
Secretary of Agriculture

Wilson Scaling
Chief, Soil Conservation Service

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Nancy M. Garlitz
Editor

Paul D. Barker
Associate Editor

Kim M. Berry and Kathleen Diehl
Contributing Editors

Christopher Lozos
Design Consultant

Magazine inquiries
Send inquiries to: The Editor, *Soil and Water Conservation News*, Public Information Division, Soil Conservation Service, U.S. Department of Agriculture, P.O. Box 2890, Washington, DC 20013-2890.

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Comments from the SCS Chief:

Doing Our Part to Conserve Water

WE ALL HAVE RIGHTS and responsibilities when it comes to water use. This precious resource is our lifeblood, so we each have to ask ourselves if we're doing our part to use it wisely.

I know that water use on my ranch affects not only my own operation but my neighbors' as well. And I know that water quality considerations and water conservation are inseparable. So, I maintain the best possible vegetative cover on my land by using a proper stocking rate.

Successful farmers know there's tremendous scientific capacity to manage water. They know their soil and its ability to hold moisture and nutrients. They learn how to use agricultural chemicals prudently. That's all critical information to the dryland farmer or the irrigator. The same goes for understanding the moisture needs of different crops. If you're irrigating, you look at the efficiency of your system. Putting all this information together is what we mean by total resource management. It makes good sense for the pocketbook as well as the environment.

If I were a reservoir manager or an irrigation district supervisor, I'd be asking myself these questions: Have I made the best use of new technology to meet all the demands of my facility? In western parts of the country, I'd link up with today's reliable snowpack survey and water-supply forecasting system.

Agricultural and nonagricultural users are competing intensely for water. So it behooves State and local officials to be on top of potential conflicts, encourage cooperation, and make use of the best technical advice available.

Folks in urban and industrial areas have plenty of opportunity to conserve and protect water. Home gardening and landscaping, for example, take the same kind of thinking that goes into farming, only on a smaller scale. But it all adds up.

We owe it to ourselves, our children, and our environment to conserve our precious water resources.



Water Supply

Cutting the Risks in Reservoir Management

A RESERVOIR operator in the western United States doesn't sleep much when the mountain snowpack is melting. You can't rest easy when as much as 80 percent of the water supply comes during the brief snowmelt season of spring and early summer.

Gary Stone, Federal water master for the Truckee and Carson River systems in Nevada and California, knows the anxiety in controlling water levels in Lake Tahoe and four other reservoirs. Stone relies on the latest technology and his 31 years of experience in water management to hold

mandatory lake and streamflow levels for flood control, agriculture, hydroelectric power production, municipal water supply, recreation, and fish and wildlife habitat, including habitat for endangered species.

Predicting how much water the mountain snowpack will provide and when is not easy. You have to consider many variables, including precipitation, wind, air temperature, moisture content of the snow, and how much water is taken up by the mountain soils and vegetation; also to consider are the char-



Utah's Porcupine Reservoir—like many reservoirs in the West—receives most of its water from snow melting at higher elevations. (Photos by Ron Nichols.)

Stone's goal is to fill the reservoir as the last snow melts. This requires frequent monitoring of snowpack data and staying in constant contact with SCS snow survey experts.

acteristics of the streambed and how quickly it channels water. Fill the reservoir too soon and you risk flooding; fill it too late and you can't meet your customers' needs.

Stone and many other reservoir operators throughout the Western Mountains use snow survey information provided by the Soil Conservation Service and the National Weather Service. Since 1935, SCS's cooperative Snow Survey Program has taken a lot of the guesswork out of predicting snowmelt runoff. And pioneering work in radiotelemetry by SCS in

the past 10 years has dramatically increased the speed and frequency of snow survey data collection and the accuracy of water-supply forecasting. Remote snow telemetry (SNOTEL) sites contain devices that monitor temperature, precipitation, and the amount of water in the snowpack. These data are transmitted by meteor burst radio telemetry to the agency's centralized forecasting system, which users can access through computer terminals.

Stone's goal is to fill the reservoir as the last snow melts. This requires frequent monitoring of snowpack data and staying in con-

stant contact with SCS snow survey experts. "In the early days (before SNOTEL), 750,000-acre-foot Lake Tahoe was about impossible to manage," said Stone. Now, during peak runoff, he can monitor the snowpack daily, or as often as every 60 minutes. He also coordinates the forecasts with utility companies that do some of their own snowpack monitoring.

Dick Cassidy, with the U.S. Army Corps of Engineers' Portland, Oreg., district knows the value of SNOTEL data in balancing priori-



Irrigation is one of the many uses of water supplied by western reservoirs.

Opposite page, Phil Farnes, SCS snow survey supervisor (at left in photo), checks sampling tube for unwanted debris before taking snowpack sample near Montana's Scotch Bonnet Pass. Don Huffman, SCS hydrologist, prepares to record their findings.

Many reservoir managers have found that putting their experience together with SNOTEL and the latest reservoir management technology cuts their risks in making the tough calls brought on by droughts, competing water uses, and liability for flood protection.

ties and meeting special needs of water users. His office oversees 13 multipurpose reservoirs in the Willamette River Basin and two additional reservoirs on the Rogue River, which is guaranteed special protection as one of the Nation's wild and scenic rivers.

Cassidy noted that SNOTEL data have helped refine runoff forecasts to meet the growing needs of water-based recreation, which was a low priority when the reservoirs were designed and water allocation rules were established. And along the Rogue River, timely snowpack data allow him to precisely manage flow levels to

meet the needs of fish hatcheries, recreational fishing, and other uses. "Whereas a flow change of hundreds of cubic feet per second goes unnoticed in the Willamette, a change of barely a hundred cubic feet per second in the Rogue should get you phone calls," said Cassidy. "It's that sensitive."

In Montana's Bitter Root Irrigation District, Jay Chamberlin manages the 35,000-acre-foot Como Reservoir to provide irrigators in the Bitter Root Valley with 90,000-acre feet of water a year. Chamberlin has to figure how much water to divert around the reservoir early in the snowmelt season so that enough room is left in the reservoir to hold floodwater without risking being able to fill the reservoir before snowmelt ends. This is particularly challenging because water moves fast through the steep canyons in the Como watershed. "SNOTEL gives me the flexibility to keep out of a crisis situation," said Chamberlin. "I keep a cushion and top off about right."

Giving Chamberlin the edge is a reservoir operation guide developed by SCS. Using historical inflow records for the reservoir, SCS prepares graphs that help the reservoir operator select the appropriate setting for outflow gates according to the current streamflow forecast and the reservoir's capacity for additional storage. The graphs "let you manage for the water supply you anticipate, rather than float with the conditions you have," said SCS Snow Survey Supervisor Phil Farnes of Bozeman, Mont. "It's like a household budget." Without this or some other planning tool, oper-

ators might resort to the fill-and-spill approach: filling reservoirs as soon as possible in spring and sending the rest of the runoff downstream. This can have disastrous consequences because, after they are full, reservoirs are unable to protect downstream areas from erosion and flood damage.

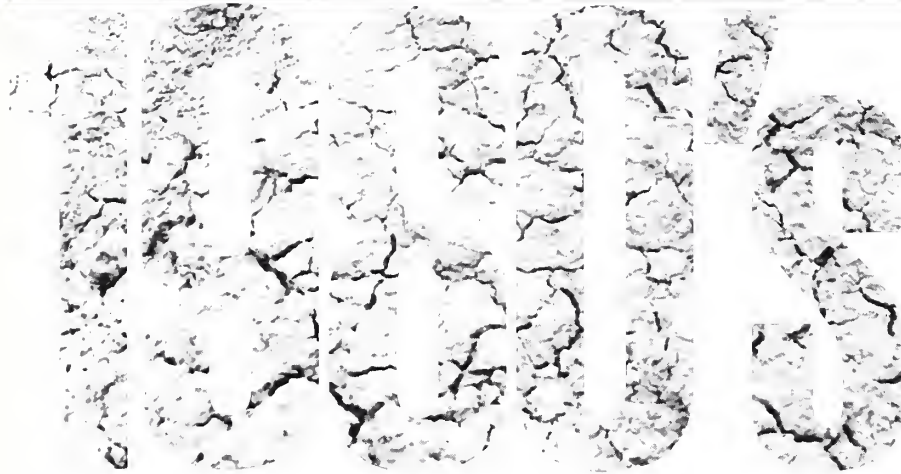
There's still no substitute, however, for experience. Farnes observed that it's "like making weather forecasts: You can't crank out a number and say 'this is it.' You also have to look out the window."

During the droughts of 1987 and 1988, timely water-supply forecasts gave the water resource community a head start on preparedness. Many reservoir managers have found that putting their experience together with SNOTEL and the latest reservoir management technology cuts their risks in making the tough calls brought on by droughts, competing water uses, and liability for flood protection. "For today's professional manager," said Dave Johnson, Snow Survey Program manager for SCS at the West National Technical Center, Portland, Oreg., "it makes good sense to have SNOTEL and water-supply forecasts on your side."

David Moffitt, public affairs specialist, SCS, Washington, D.C.



The 1988 drought was the worst to hit the Midwest since 1936. It was also the most severe to hit early in the growing season.



A Decade of Drought

Low water levels in Iowa's Skunk River were typical of those in other streams and rivers in the Midwest during the 1988 drought. (Photos by Ron Nichols.)



THE 1980's has been a decade of drought. According to the Climate Analysis Center of the U.S. Department of Commerce, 1982 was the only year of the decade when drought didn't occur somewhere in the United States.

According to the National Oceanic and Atmospheric Administration, the 1988 drought was the worst to hit the Midwest since 1936. It was also the most severe to hit early in the growing season, said Norton Strommen, chief meteorologist at the U.S. Department of Agriculture in Washington, D.C.

"The unique thing about this drought was its intensity in April, May, June, and the first half of July," said Strommen. "That's the thing that really stands out about this year's problem."



Drought damage to crops reduced the amount of residue left on the soil after harvest, cutting the natural soil protection.

When the drought peaked in mid-July, 43 percent of the country suffered extreme or severe drought.

Soil Conservation Service officials in Iowa, concerned about heightened soil erosion because of drought conditions, advised farmers not to till their fields this fall.

There is a definite correlation between plowing or tilling in the fall and moisture loss. The best way to conserve soil moisture is not to till.

According to Jim Ayen, State resource conservationist for the Soil Conservation Service in Des Moines, Iowa, tilling always exposes the soil to the risk of wind and water erosion.

"Since the soil is drier this year, it will be especially vulnerable to wind erosion," said Ayen.

Scott Argabright, a conservation agronomist at SCS's Midwest National Technical Center in Lincoln, Nebr., confirms that the risk of soil erosion is greater anywhere there has been a drought. He said drought damage to crops reduced the amount of residue left on the soil after harvest, cutting the natural soil protection.

Rain during drought is a problem too, according to John Pingry, an agronomist at the SCS State office in Des Moines.

"Each raindrop is like a little bomb," said Pingry. "Rainwater breaks bare soil into smaller particles and washes it away."

Purdue University weed scientists are talking about another

drought-related problem: herbicide carryover into 1987 and 1988 planted crops.

"We suspect there is an enhanced potential for a carryover problem in 1989," said Tom Bauman, Purdue weed scientist. "For example, many soybean herbicides are relatively new, so their persistence under dry conditions is unknown," he continued.

What is the prediction for the last year of the 1980's? Will the decade of the drought continue?

"We've seen a promising trend this fall toward an increase in soil moisture," meteorologist Strommen said. "We've still got the rest of winter and spring to add to this. I'm encouraged."



Farmers in Charlotte County, Va., send hay to Ohio farmers suffering from the 1988 drought. The Ohio farmers had sent them hay the previous year when drought conditions were worse in Virginia.

Mature ear of Iowa corn reveals the serious impact of the 1988 drought.

No-till Weathers Drought of '88

"As far as we know at this time, it appears that most of those who have been practicing no-till for several years did as well as, or better than, those who used conventional tillage."

THE DROUGHT this past summer in the Midwest was one of the worst of the century. To get a better idea of how the region's farmers fared, *Soil and Water Conservation News* conducted the following interview with David Schertz, national agronomist for the Soil Conservation Service.



Corn on Kenneth Smith's farm near Lamoni, Iowa, shows poor pollination and stunted growth caused by the drought of 1988. (Photos by Ron Nichols.)

Q. Just how bad was the drought?

A. The National Weather Service (the National Oceanic and Atmospheric Administration) has called it the worst drought to hit the Midwest since 1936. I think the most damaging aspect was that rainfall was less than half the normal for April, May, and June—a critical period for Midwestern grain farmers.

Q. What were the effects on farmers?

A. Corn and soybean farmers generally suffered the most. Final yield figures aren't in yet, but it appears that average per-acre yields will be down more than 30 percent for corn and more than 20 percent for soybeans. The dry conditions also led to some increase in wind erosion.

Q. Why wasn't there another Dust Bowl?

A. Well, for one reason, we didn't have as much wind as in the 1930's when we had several overlapping drought years and windy years. Another reason is that farmers have applied a lot of conservation practices since then. Conservation tillage, for example, had not even been heard of in the 1930's. This past year more than 88 million acres was in some form of conservation tillage, and more than 12 million acres of that was in no-till.

Q. How did no-till farmers do in terms of yields?

A. Continuous no-tilling creates a rich layer of organic matter on top of the soil that not only helps reduce erosion but also helps hold soil moisture. As far as we know at this time, it appears that most of those who have been practicing no-till for several years did as well as,

or better than, those who used conventional tillage. One exception was where a crop was no-tilled into an existing sod or cover crop. Late spring growth of the sod or cover crop depleted the soil profile of available moisture, making it very difficult for the new crop to survive.

Q. What about those farmers who were new to no-till?

A. Many farmers who were new to no-till had problems. Their soil, which had been conventionally tilled for years, had poor tilth and formed a hard crust on the surface. In these situations, seedlings had trouble breaking through the crust, and roots had difficulty getting to the fertilizer.

Q. How extensive was this problem?

A. Here again, we still don't have the final yield figures. No-till is a growing practice and every year there are a lot of first-time users. We estimate that farmers were practicing no-till on corn for the first time this year on about 200,000 acres, and we expect that many of these farmers had problems because their soil was already compacted by years of conventional tillage.

Q. Does this mean farmers can make the switch to no-till faster than their soils?

A. I guess you could put it that way. Farmers in their first year or two of no-till can have management, timing, and application problems—even in normal rainfall years—but these are very site specific and difficult to generalize.

"Don't expect to be a successful no-tiller overnight. Talk to others who have used no-till for several years on similar soils."



National average yields for corn—the crop generally most damaged by the drought—are expected to be off more than 30 percent. The lack of rainfall also slowed barge traffic on the Mississippi River, at right.



Q. In retrospect, now that we know there was a drought, would conventional spring tillage have been better for these farmers?

A. While it's true that spring tillage might have broken up the crust, there most likely would have been even less soil moisture for germination and early growth due to increased evaporation from the tilled soil. My guess is that the systems that kept spring tillage to a minimum probably proved to be the best choice this year.

Q. How else did no-till affect crops?

A. Well, the timing of the drought—during the planting and early growth periods—was particularly damaging. But in some places, no-till helped crops to survive the drought until the rains came in late July.

Q. How did no-till do that?

A. Because of cooler spring soil temperatures, no-till corn, for instance, probably wasn't as far along as conventionally tilled corn. This means that conventionally tilled corn tasselled sooner than no-till corn and may have tasselled in the main part of the drought, whereas the no-till corn may have tasselled later and benefited more from the late July rains. However, this benefit may have been offset in areas that had an early killing frost.

Q. What other problems did no-till farmers encounter?

A. A lot of the problems being reported as no-till failures were actually management problems, such as nitrogen fertilizer remaining on top of the ground and volatilizing in the dry weather or the improper adjustment of equipment for no-till.

Q. What would you tell farmers who tried no-till for the first time last year, who lost their crops, and who are considering going back to conventional tillage?

A. First of all I'd say not to judge any practice on the experience of only one year, particularly a year like the one we've just been through. A drought year that severe probably occurs only once in a lifetime. Next, don't expect to be a successful no-tiller overnight. Talk to others who have used no-till for several years on similar soils.

Q. In other words, give no-till another chance?

A. Yes. And farmers and ranchers shouldn't forget one of the key reasons why they're practicing no-till. No-till is extremely effective in reducing soil erosion—as much as 90 percent reduction is possible compared to conventional clean tillage. No-till also saves time, fuel, labor, and wear on equipment. And no-till farmers

have less capital tied up in expensive equipment. There are many advantages to no-till and other types of conservation tillage.

Q. Do you recommend any changes for no-till farmers?

A. In general, no. There will always be improvements as we learn more and refine the practice, but we shouldn't overreact to the drought. I've heard some no-till corn farmers say they are going to plant deeper next year, but I think that would be a mistake in a normal year. And most years are, after all, fairly normal. I expect all of us will be paying closer attention to long-term weather forecasts. As our ability to predict growing season weather patterns improves, more preplanting adjustments will be possible. I believe this type of technological improvement will have the greatest impact on reducing damages from future droughts.

Contractors Help With Checkouts

SOME 1,600 CONTRACTORS are now providing critical check-out documentation for the conservation practices they install. By 1990, that figure is expected to more than double.

The Soil Conservation Service and local conservation districts use the check-out documentation—such as land surveys—to verify that practices are correctly installed. SCS and district officials conduct spot checks of the documentation to assure farmers that they are getting a quality product—one that meets the agency's design criteria.

"We've had a longstanding policy of training conservation contractors and accepting their documentation," said Donald Basinger, director of the engineering division at SCS's national headquarters in Washington, D.C. "With the increased workload as a result of the conservation provisions in the FSA (Food Security Act of 1985), we're accelerating our efforts to train contractors."

One of the agency's efforts has involved the Land Improvement Contractors of America (LICA), a major trade association with 4,000 members in 48 States. SCS and LICA recently signed a memorandum of understanding for cooperative training efforts.

SCS Chief Wilson Scaling was positive about the new level of cooperation. "Required conservation plans must be implemented by the end of 1994," he said. "That means a tremendous number of conservation practices must be installed and must meet SCS

quality specifications. We can't meet these goals alone. This agreement will enable conservation contractors to improve their skills and assist in checking out the completed work."

SCS will provide or assist with training for conservation contractors in layout and construction checks of conservation practices. The goal is to develop a cadre of conservation contractors with the knowledge and skills to handle much of the construction documentation, as well as high quality construction.

"We're pleased with the way the checkouts are working," said Jack Hufstetler, chairman of the board of LICA. "We have 87 contractors in Alabama who have received training certificates, and we're about to start similar training in Georgia this fall," he said. "Most of the practices we're checking out here are terraces, waterways, diversions, and small farm ponds."

Contractor checkouts are used extensively in several farming States where the FSA has drastically increased the SCS and district workload. Contractors who do conservation work in Kansas, for example, will check out about 75 percent of the waterways, terraces, diversions, land leveling, and other commonly applied practices this year. Most are trained by working one-on-one with SCS and district employees.

"We wouldn't fulfill the FSA requirements without the cooperation and help of contractors," said Jim Wallace, SCS State conservation engineer in Kansas. SCS and districts save about 8 person-years in Kansas through contractor

checkouts. That frees up technicians and others to do more complex work.

Contractors who conduct their own checkouts benefit by being able to correct their mistakes before leaving the job site. "Contractors have also found that they better understand design requirements by checking their own work," said Wallace, "and are able to construct practices easier and quicker—which nets more profits."

Diana Morse, public affairs specialist, SCS, Washington, D.C.

Soil Survey Blitz In Nebraska

ONE OF THE MANY effects of the Food Security Act (FSA) of 1985 on the Soil Conservation Service is the sudden critical need for completing the ongoing nationwide soil survey. Only with complete soil information can SCS identify highly erodible cropland and wetlands as required by the conservation provisions of the FSA.

In Nebraska, when farmers began requesting highly erodible land determinations on 55,000 acres of irrigated cropland not yet surveyed, accelerating the survey became critical.

"Because we were nearing the end of our modern soil survey mapping, there was a shortage of soil scientists in Nebraska," said Jim Culver, former State soil scientist now with the agency's Midwest National Technical Center in Lincoln. "Our soil scientists had been transferring to States with greater mapping needs."

To solve the problem, SCS used temporary reassignments of personnel and expanded its cooperative agreement with the University of Nebraska-Lincoln's Conservation and Survey Division. This enabled Survey Party Leader Mark Willoughby to obtain the services of eight soil mappers who averaged 20 years of survey experience. The surveyors reported for duty in October 1987 in Scottsbluff, Nebr., and, because of their high levels of experience, were able to begin mapping within hours.

The area surveyed is on the foot slopes and high stream terraces of the North Platte River Valley. It is sliced with an irrigation canal system, and many acres have been leveled, changing the natural lay of the land.

"Even with this complexity of mixed soil profiles, the team completed the job in 2 weeks, mapping 830 acres a day each," said Culver, "a commendable rate." He said a field review of the team's work indicated uniformly high quality mapping.

The surveyors identified soils of more than 15 different soil series, including one previously unnamed soil. In all, nearly 50 soil map units were mapped on the landscape.

"The maps are now available for producers and conservation planners," said Larry Brooks, SCS area conservationist. "The field office will now be able to complete the determinations of highly erodible land and wetland. In fact, we are now accelerating the cropland soil mapping in another county with the same cooperative effort."

Norm Helzer, State soil scientist, SCS, Lincoln, Nebr.

Other Farmers Are Most Valued Sources of Information

ACCORDING TO *Conservation Tillage Adoption: A Survey of Research and Education Needs*, farmers rank other farmers as their most valuable source of conservation tillage information. That's why it is so important to make every attempt possible to improve communications so the rumor mills are correct. Rumor mills, contrary to popular thought, can be used wisely and effectively to relay important information throughout a rural area.

Technical advice ranked second as a valuable source of information. Survey respondents regard research conducted by universities or government agencies as the most reliable, even though they felt agency personnel are not as well informed about conservation tillage as they should be.

Farm magazines ranked third as valuable sources of information.

Conservation Tillage Adoption: A Survey of Research and Educational Needs was conducted by the Conservation Technology Information Center, 1220 Potter Drive, Room 170, Purdue Research Park, West LaFayette, IN 47906-1334.

One Year to Deadline

THE SOIL CONSERVATION Service is launching a direct mail and media campaign in January to alert landowners with highly erodible cropland about the need to have an approved conservation plan by December 31, 1989. Landowners will need the approved plans to retain their U.S. Department of Agriculture (USDA) program benefits.

The direct mail campaign will include a personalized letter to landowners and a companion brochure entitled "Make Your Move Now!" The brochure features a colorful game board to show farmers what "moves" they must make to stay eligible for USDA programs, including price and income supports, crop insurance, Farmers Home Administration loans, Commodity Credit Corporation storage payments, farm storage facility loans, and other programs.

Mailings will be done in early 1989 by SCS field offices. These offices will create local mailing lists based on who has highly erodible land.

A mass media campaign using newspaper, magazine, and broadcast stories, public service announcements, advertisements, and posters will be launched in conjunction with the mailings. In addition, farm and conservation groups will be kept informed about the campaign so they, in turn, can keep their membership informed.

Moving?

Send present mailing label and new address including zip code to:

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Soil Conservation Service
P.O. Box 2890, Room 6202-S
Washington, D.C. 20013-2890

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SCS and District Employees Learn to Manage Stress

THE CONSERVATION PROVISIONS of the Food Security Act of 1985 have created an opportunity for the Soil Conservation Service to help more farmers and ranchers apply more conservation practices on more land than ever before. The provisions have also drastically increased the SCS workload—especially in heavy farming States—and placed many field office employees in new and often-times stressful situations.

The agency's response to the increased stress on its employees has varied from State to State, ranging from employee counseling, to innovative ways of managing the workload, to special group training. The Oklahoma State office of SCS, for example, hired a consulting firm to help employees identify and deal with stressful situations.

"We are working with farmers that we have never dealt with and some of them are not sure what to expect," said Budd Fountain, SCS State conservationist in Oklahoma. "The stress level for both SCS employees and farmers has definitely increased, and we wanted to provide training to our people so they could better deal with the situation," said Fountain.

Beginning in the fall of 1987, the firm provided a series of 4-hour training sessions in which SCS employees were taught how to identify client attitudes and how to deal with the person first and then the situation. The employees put what they had learned into practice and discussed their experiences at a second session a month later. The second session concentrated on how employees can tell when they are entering into a stressful situation and how to deal with it.

The training focuses on dealing with farmers, ranchers, and other

clients as well as fellow employees and family members. More than 350 SCS employees and 40 conservation district employees in the State have now completed the course.

"Employees tell us that the training has helped them to better understand and deal with their own feelings and emotions and prepared them to better handle stressful situations," said Fountain.

Dwain Phillips, public affairs specialist, SCS, Stillwater, Okla.

Ag Events 1989

March	19-25	National Wildlife Week
	20	National Agriculture Day
	19-25	National Agriculture Week
April	1-30	Keep America Beautiful Month
	To be announced	National Volunteer Week
	28	National Arbor Day
	30-May 7	Soil and Water Stewardship Week
May	1-5	International Land, Pasture, and Range Judging Contest
June	5	World Environment Day
September	9	Public Lands Day
	17-23	National Farm Safety Week
	23	National Hunting and Fishing Day
October	16	World Food Day
	1-7	National 4-H Week
	8-14	National Fire Prevention Week
November	17-23	National Farm City Week